

SAFIRE Spectral Resolution

SO FIA

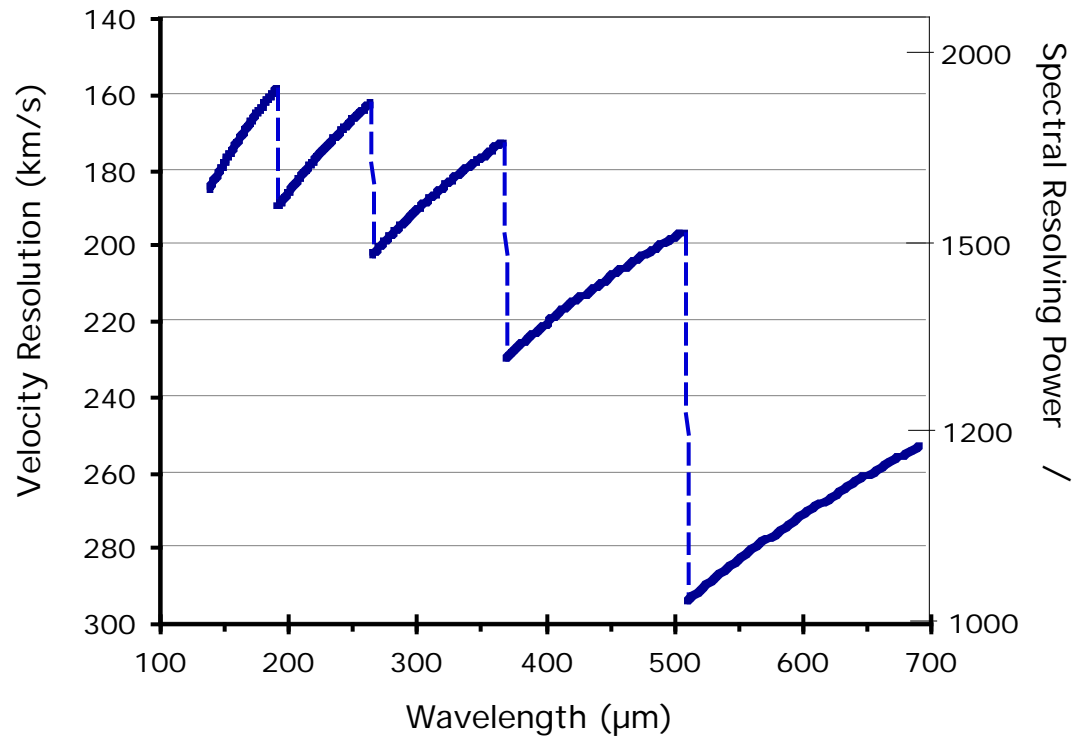
Wavelength range: 145 - 655 μm

The spectral resolution plotted corresponds to the FWHM of the instrument line spread function for a monochromatic line from a point source. This plot is only representative; order selection and spectral resolution are provided by a chain of fixed and tunable Fabry-Perot filters, resulting in a variety of resolving power choices (TBD).

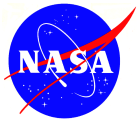
Incremental wavelength changes can be made on the fly in a stepped mode, enabling real-time imaging spectroscopy.

Error in velocity determination
10 km/sec (TBC) for unresolved lines

Wavelength setting accuracy
corresponds to about 10% of the resolution,
e.g. 20 km/s at $R = 1500$.



Free spectral range :
several values possible,
~20 μm typical (TBD)



SAFIRE Sensitivity

SO FIA

SAFIRE sensitivity is shown for a monochromatic line from a point source, at the spectral resolution plotted on the previous page.

MDLF is the “minimum detectable line flux”,
4 in 15 minutes (900 seconds).

The plotted curve connects points at wavelengths where atmospheric transmission exceeds 80%. Where transmission is low, the MDLF will be much higher.

MDLF scales roughly as $(S/N) / \sqrt{t}$
where t = net integration time

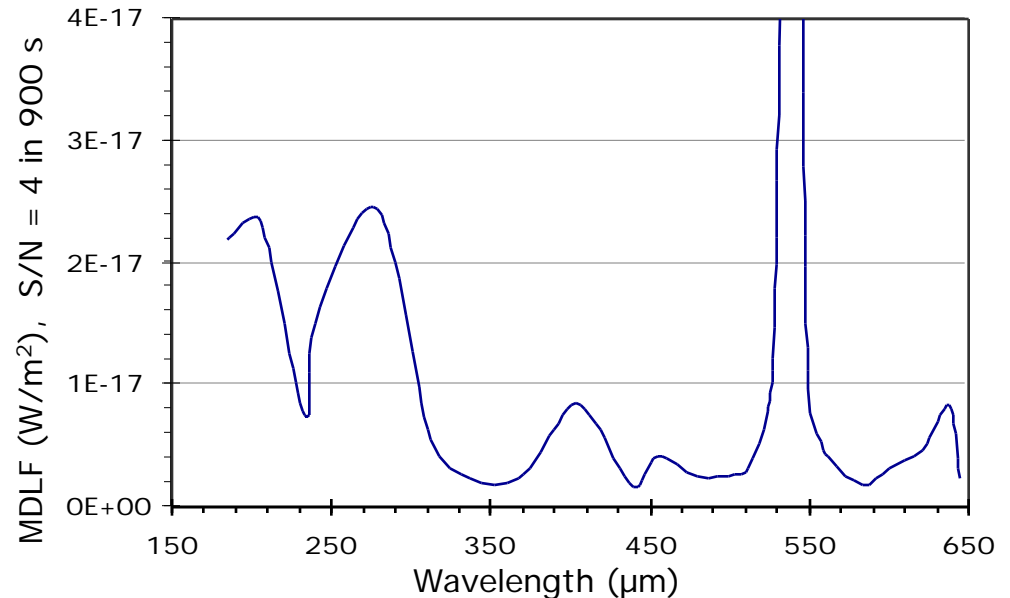
Minimum detectable continuum flux MDCF
(4 , 15 minutes):

= 100-300 μ m: ~ 0.5 Jy

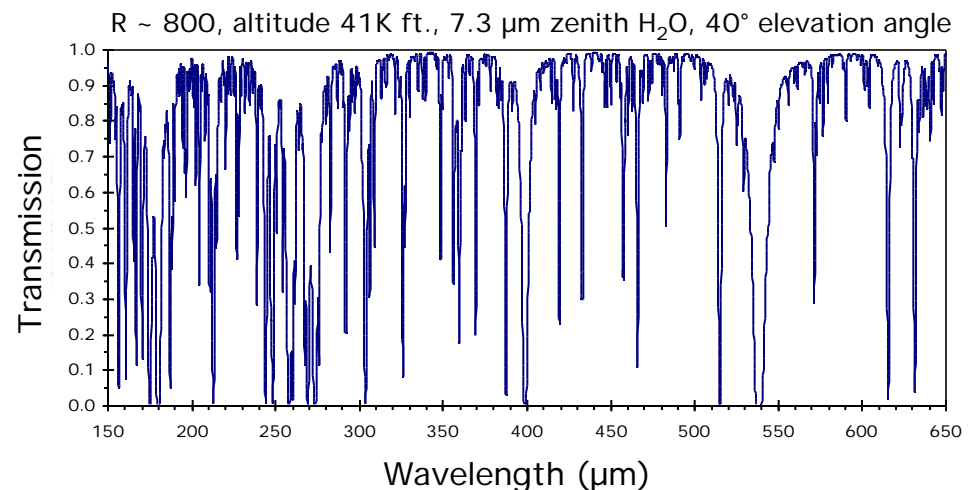
= 300-700 μ m: ~ 0.3 Jy

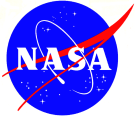
Calibration and setup overhead time is roughly 20%.

Line measurements in bright continuum sources may take longer to reach the same S/N.



Atmos. Transmission for 150 - 650 μ m





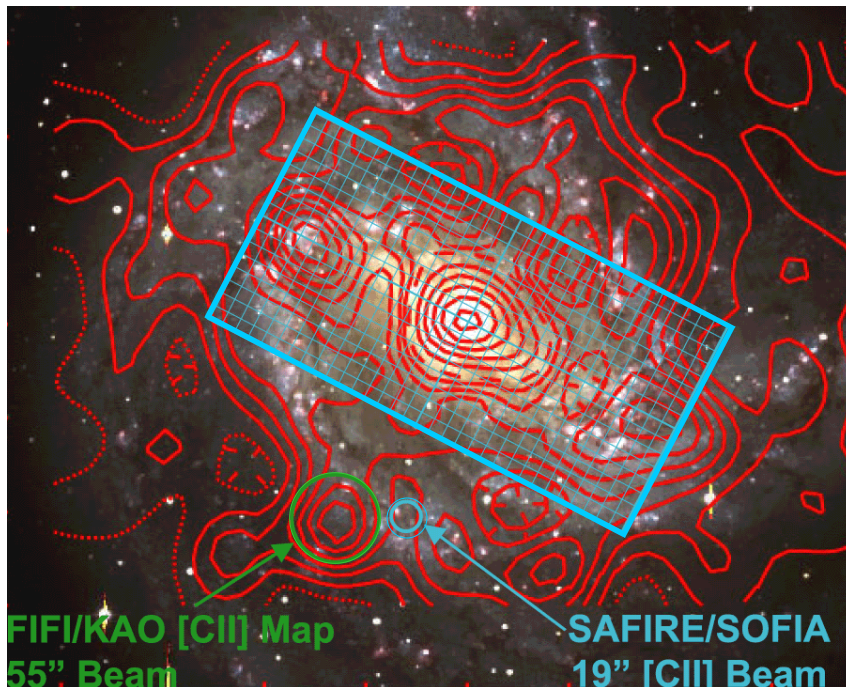
SAFIRE Angular Resolution

SOFIA

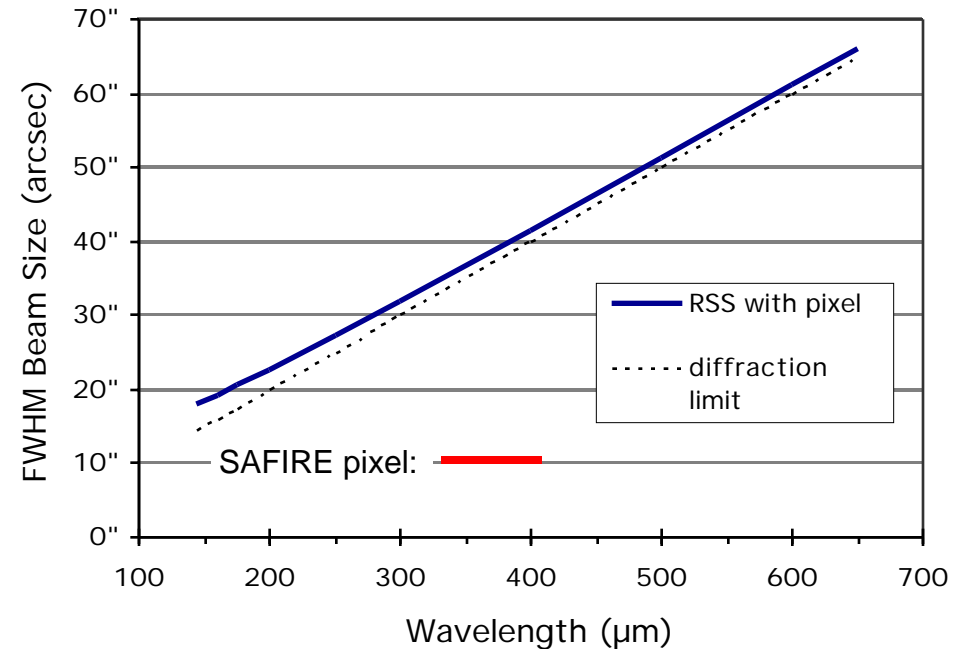
Beam size shown is the instrument FWHM size for nominal operating conditions.

Field of View = 160" x 320"

16 x 32 pixel array, 10" / pixel



SAFIRE FOV and beam size at 158 μm (C II) shown superimposed on visible image and C II map of face-on spiral galaxy M 83. Also shown is beam size for FIFI used on KAO to obtain the C II map. The latter is also the SAFIRE beam size at about 550 μm .



Notes:

- Final images from SAFIRE with angular resolution equal to the SOFIA telescope diffraction limit should be possible with use of appropriate observing techniques and post-flight analysis.
- Higher spectral resolution may be limited to a smaller FOV.
- Plate scale changes are possible with added optics, to improve resolution at shorter wavelengths.